

Background article

## **Switzerland:**

### **Top-class when it comes to natural refrigerants**

In view of the revised F-Gas Regulation, the refrigeration and air-conditioning branch is looking to change over to environmentally-friendly and viable applications that are also economically profitable. Switzerland is a major pioneer in this respect. But what exactly has put the Alpine state in this position? Outstanding energy standards and legislation demanding sustainable refrigeration and air-conditioning solutions definitely play an important role. But a significant contribution also comes from the innovation commitment of planners, combined with great willingness on the part of operators to implement new technologies. Demanding legislation and trend-setting projects – in this portrait, eurammon shows why Switzerland has a tradition of advocating natural refrigerants.

#### **Statutory restrictions for refrigerants impacting on the climate**

In Switzerland, the Ordinance on Chemicals Risk Reduction regulates the use of substances said to be stable in air – volatile fluorinated hydrocarbons with a half-life period in air of more than two years. This includes nearly all fluorinated refrigerants apart from R-152a and many HFOs. A further tightening of the regulation means that since the end of 2013, there is also a partial ban on systems that run on refrigerants with high global warming potential. "Emissions from refrigerants impacting on the environment must be avoided as far as possible in technical and economic terms. To this end, we have adjusted the prohibitions according to current state-of-the-art engineering to make them demanding but still feasible", says Blaise Horisberger from the Federal Office for the Environment (FOEN). In practice, this ban affects industrial refrigeration systems above 400 kW, commercial refrigeration systems from smaller capacity ranges, air-conditioning systems and thermal pumps above 600 kW and also artificial ice rinks. "According to our estimates, the current regulation should result in natural refrigerants and HFOs accounting for about two thirds of the installed quantity of refrigerants in the long term", says Horisberger. "If natural refrigerants continue to be used with such success, there is a good chance that users in future will opt mainly for ammonia, CO<sub>2</sub> and co."

#### **Smart use of synergies: ammonia for refrigeration and heating**

An altogether positive example for using natural refrigerants can be found south of Chur with Fleischtrocknerei Churwalden AG, a meat-drying company located at 1,000 metres above

sea level. In order to make the most sustainable possible use of resources, the building has been successively brought in line with the very latest technical standards. To this end, the company also installed a new refrigeration system – of course with ammonia. "Many of our customers want a solution with natural refrigerants to ensure they can use their system in the long term – this also applies to Fleischtrocknerei Churwalden", reports Beat Schmutz, Managing Director of the eurammon member SSP Kälteplaner AG. Both heat energy and refrigeration energy is needed all year round to dry the meat, so that SSP Kälteplaner advocated an integral building concept that uses the waste heat from the new refrigeration system for heating and hot water. The waste heat from generating compressed air and refrigeration is collected in a large stratified storage tank that can hold 30,000 litres. From here, the waste heat is then distributed at selected temperatures to the individual distribution units. Fleischtrocknerei Churwalden is now almost in a position to manage without the old oil boiler system that used to generate most of the heat energy. It is now only used to cover peak demand. As a result, annual oil consumption has sunk by 70%. The massive reduction in CO<sub>2</sub> emissions is similarly impressive. The new system saves a full 320 tonnes CO<sub>2</sub>, thus making a considerable contribution to climate protection.

### **Tradition of supermarket refrigeration with natural refrigerants at Migros**

Energy-efficient, low-cost and kind to the climate: when it comes to commercial refrigeration, operators such as Migros, one of Switzerland's largest supermarket chains, show the way. Migros has been using ammonia systems and various CO<sub>2</sub> solutions for both deep-freezing and chilling already since 1994. Today CO<sub>2</sub> is the standard refrigerant, used in more than 370 systems at over 277 supermarkets – mostly as a CO<sub>2</sub> booster system with waste heat exploitation. Numerous stores can only be heated by this waste heat. The reasons for the long tradition of systems with natural refrigerants are to be found in a holistic climate and energy strategy: "Our aim is to achieve a 20% reduction in direct and indirect emissions of greenhouse gases by 2020, compared to 2010", explains Urs Berger, Head of Energy and Building Systems at Migros. "In the end, direct greenhouse emissions can only be eliminated with a natural refrigerant such as carbon dioxide". Energy efficiency is just as important for commercial refrigeration. Here there has been a clear increase at Migros. Before introducing the CO<sub>2</sub> technology, the target refrigeration index was 4,000 kW/m x a, which refers to the electricity consumed by the refrigeration system per system length in metres and year. "Meanwhile our current targets have fallen to between 2,000 and 2,700 kWh/ m x a, thanks to the efficiency of our systems", says Berger. Massive reductions in operating costs are another financial argument in favour of these systems. The specific CO<sub>2</sub> safety requirements are fulfilled by the refrigeration system manufacturers and by the operators. "Every change

in technology also entails a learning phase. The CO<sub>2</sub> systems have proven their worth in practice and are reliable", emphasises Urs Berger.

### **First refurbished artificial ice rink in Minergie-Standard**

Outdated artificial ice rinks in need of renovation pose a particular challenge. They need huge refrigerating capacity and often impose considerable space constraints on new refrigerating systems. The eurammon member acoenergy has faced up to this challenge in a current project and implemented the very strictest energy standards. The new refrigerating system for a regional ice sport centre in Switzerland's Central Plateau faces demands for maximum energy efficiency and low operating costs together with low investment costs. To this end, acoenergy developed a highly efficient, indirect NH<sub>3</sub> system with a water/glycol blend as secondary refrigerant for cooling the ice rinks and a curling arena with a refrigeration capacity of approx. 1.2 MW. It will be starting operations in two phases in 2016 and 2017, resulting probably in reductions of up to 34% in energy and about 50% in CO<sub>2</sub> emissions. The special thing about the refrigeration system is that it complies with the Minergie-Standard – a voluntary quality guideline for energetically optimised buildings that goes over and beyond the statutory requirements. 23 criteria apply to artificial ice rinks, including for example a minimum waste heat exploitation level of 70%, which has to be verified by means of detailed balance sheets. Provisional certification has already taken place and will be followed by a two-year optimisation phase to give operations the final polish in order to become top-class in energetic terms. "New-build projects for artificial ice rinks are primarily planned on the basis of this voluntary ecological standard", says Stephan Lutz from acoenergy. "Our refurbishment project will be the first of its kind."

### **Into the future with highest standards**

Switzerland shows examples of how natural refrigerants can be put to successful use, while fulfilling the strictest energetic standards at the same time. "Switzerland plays this pioneering role because it has forged ahead with the use of natural refrigerants by systematically restricting refrigerants impacting on the climate. The refrigeration branch has taken up this challenge and operators also attach great importance to sustainable refrigeration technology", explains Urs Berger from Migros. In short, Switzerland has managed to meet the challenge of ever tighter statutory requirements – and is looking further ahead to the future. There is still great potential for huge reductions in direct and indirect emissions of greenhouse gases by using natural refrigerants, particularly in small capacity ranges, such as smaller refrigeration or heat pump systems.

((Insert figures here))

The **Minergie-Standard** stipulates 23 criteria for artificial ice rinks, including a minimum waste heat exploitation level of **70%**.

The new system of Fleischrocknerei Churwalden impresses with the **massive reduction in CO<sub>2</sub> emissions** – it saves a full **320 tonnes CO<sub>2</sub>**.

Find further information about the **Ordinance on Chemicals Risk Reduction** at: <http://bit.ly/1nCZzc0>

#### Captions

- Picture 1: The large stratified storage tanks in Churwalden have a capacity of 30,000 litres.
- Picture 2: The new ammonia plant at Fleischrocknerei Churwalden combines refrigeration and the use of waste heat.
- Picture 3: CO<sub>2</sub> systems and chilling cabinets with glass doors help Migros save a lot of energy.
- Picture 4: An indirect ammonia system with a refrigeration capacity of approx. 1.2 MW cools the ice rinks and a curling arena.

#### **About eurammon**

eurammon is a joint European initiative of companies, institutions and individuals who advocate an increased use of natural refrigerants. As a knowledge pool for the use of natural refrigerants in refrigeration engineering, the initiative sees as its mandate the creation of a platform for information sharing and the promotion of public awareness and acceptance of natural refrigerants. The objective is to promote the use of natural refrigerants in the interest of a healthy environment, and thereby encourage a sustainable approach in refrigeration engineering. eurammon provides comprehensive information about all aspects of natural refrigerants to experts, politicians and the public at large. It serves as a qualified contact for anyone interested in the subject. Users and designers of refrigeration projects can turn to eurammon for specific project experience and extensive information, as well as for advice on all matters of planning, licensing and operating refrigeration plants. The initiative was set up in 1996 and is open to European companies and institutions with a vested interest in natural refrigerants, as well as to individuals e.g. scientists and researchers.  
Internet URL: [www.eurammon.com](http://www.eurammon.com)

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